

Observer Quality Control of NWS Upper-air Soundings

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Observers must make every effort to quality control their rawinsonde observations prior to dissemination to data users. Transmitting poor quality soundings can lessen the accuracy of weather forecasts and warnings.

Below are guidelines for ensuring high quality upper air observations:

References: NWS Manual 1401 and RRS Users Guide.

1. ***Inflate the balloon correctly.*** Observers must strive for an average balloon ascension rate between 275 and 350 meters/minute from surface to flight termination for each sounding. Average ascension rates below 275 meters/minute reduce ventilation of the temperature and RH sensors that can lead to errors in the data. Ascension rates above 350 meters/minute increase gas costs per flight and typically result in lower burst heights. Lastly, observers must not under inflate balloons in the hope that they will reach higher altitudes and result in a higher station Performance Score.
2. ***Prepare the radiosonde in accordance with the instructions.*** To ensure the radiosonde functions correctly the instrument preparation instructions must be followed exactly as stated. The radiosonde sensor boom or other components must be positioned in accordance with the radiosonde preparation instructions. With good intent, some observers bend the sensor boom differently from that noted in the instructions and believe it will provide better data or do no harm. In most cases these changes don't work and cause very erroneous data. Following all the radiosonde preparation instructions will help ensure a problem free sounding.
3. ***Do not use flight trains less than 25 meters in length.*** The balloon skin, especially when exposed to sunshine, is significantly warmer than the surrounding air. When a short flight train is used, even at night, heat from the balloon reaches the temperature sensor, contaminating the measurements.
4. ***Examine RRS data plots and take action on all check and status messages.*** RRS will alert the observer to possible data errors. If check messages are displayed (examples: super-adiabatic lapse rates, high ascent rates) observers should make every effort to edit the data accordingly **prior to** data transmission to NCEP and NCDC. If observers have questions about how to handle specific data problems not covered in the software Users Guide, they should take the initiative to contact their Regional Office for assistance.
5. ***Do not excessively smooth out bad data in a sounding.*** Sometimes radiosonde or ground equipment problems result in RRS reporting many (10 or more) super-adiabatic or other "Check Messages" that relate to problems with the pressure, temperature, relative humidity, or winds data. To solve this problem, some observers arbitrarily delete up to 9/10's of every minute of data for much of the

flight so that software will fill in the missing data with interpolated values. **THIS MUST NOT BE DONE!** Editing this much data only creates an overly smoothed sounding that is not representative of the true atmosphere. The best course of action when this situation occurs is to terminate the data (and possibly the sounding) at the point where the problems began. (see item 6 below for more information). Moreover, if the same kinds of data check messages appear from one flight to the next for several weeks or more then the ground tracking equipment and RSOIS should be examined by the station electronics technician.

6. ***Terminate a sounding early if necessary.*** NWS uses about 70,000 radiosondes each year and a small percentage will not function correctly. Sometimes a radiosonde will provide clearly erroneous temperature or pressure data from the start or later in the flight and many data check messages will be displayed. In such cases the sounding must be terminated at the point where the bad data started. If the RH and wind data are erroneous the flight does not need to be terminated. Delete the bad RH and/or winds from the point where the problem occurred to flight termination.
7. ***Don't delete good data.*** WSH has seen soundings where the observer deleted data for no apparent reason. Some observers arbitrarily delete up to 9/10's of every minute of data for much of the flight so that software will fill in the missing data during the minute period with interpolated values. **THIS MUST NOT BE DONE!** Editing good data only creates an overly smoothed sounding that is not representative of the true atmosphere. Again, refer to the software Users Guide for the correct data editing procedures.
8. ***Make sure the surface weather observation taken for the sounding is accurate.*** The surface weather observation of station pressure, temperature, RH, and wind are used as critical "tie points" for the sounding and must be accurate. Likewise, the surface observation of clouds and weather are also of importance and must be accurate. These data **must never** be edited or corrected with arbitrary values to make them fit with the sounding data aloft. If the surface weather equipment (e.g., RSOIS) appears to be out of calibration, it must be serviced as soon as possible.
9. ***NEVER release a radiosonde into or near a thunderstorm.*** If a thunderstorm is occurring at the time of balloon release, then the observer **MUST** wait (15 minutes from the last clap of thunder) until the storm passes before releasing the balloon. Here's why,
 - (a) The observer increases the likelihood of being killed by a lightning strike as he or she proceeds to release the balloon. During a storm, the flight train becomes a long lightning rod with the observer holding the lower end.
 - (b) The data collected inside or near thunderstorms are mostly garbage and are not useful for weather forecasts. The sounding does not represent the synoptic

scale environment and NCEP does not use such soundings for ingestion into numerical weather prediction models. See Figures 1 and 2 below that show Skew-T plots of radiosonde data collected inside thunderstorms.

(c) Thunderstorms typically terminate a flight early owing to balloon icing or strong downdrafts.

- 10 ***Examine ALL data quality reports issued by WSH, NCEP, and NCDC to identify data problems.*** Data quality reports are issued monthly and are available here: <http://www.ua.nws.noaa.gov/dataqc.htm> . If station staff notice prolonged, data quality problems that persist from month to month, they must contact their Regional Office Upper air program manager to help find the cause and troubleshoot the problem.

